

App. No. 10/806,803  
Office Action Dated January 11, 2006

**Amendments to the Claims:**

This listing of claims will replace all prior versions and listing of claims in the application.

Claims 14 and 15 are new.

**Listing of Claims:**

1. (Original) A field-emission electron source comprising:
  - a substrate,
  - an insulating layer that is formed on the substrate and has a plurality of openings,
  - cathodes arranged at the respective openings to emit electron beams,
  - a lead electrode formed on the insulating layer to control emission of the electrons from the cathodes; and
  - a surface-modifying layer formed on the surface of each of the cathodes emitting the electrons, comprising a chemical bond between a cathode material composing the cathodes and a material different from the cathode material.
2. (Original) The field-emission electron source according to claim 1, wherein the cathodes comprise silicon.
3. (Original) The field-emission electron source according to claim 1, wherein the surface-modifying layer comprises a chemical bond between the cathode material and a material whose sputtering rate with respect to argon is lower than a sputtering rate of the cathode material.
4. (Original) The field-emission electron source according to claim 1, wherein the surface-modifying layer comprises a chemical bond between silicon and carbon.

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5. (Original) The field-emission electron source according to claim 1, wherein the substrate comprises silicon.
6. (Original) The field-emission electron source according to claim 1, wherein the cathodes comprise molybdenum.
7. (Original) The field-emission electron source according to claim 1, wherein the cathodes are arrayed on the substrate.
8. (Original) The field-emission electron source according to claim 1, wherein each of the cathodes is shaped substantially like a cone.
9. (Withdrawn) A method of manufacturing a field-emission electron source comprising: a substrate, an insulating layer that is formed on the substrate and has a plurality of openings, cathodes arranged at the respective openings to emit electron beams, a lead electrode formed on the insulating layer to control emission of the electrons from the cathodes; and a surface-modifying layer formed on the surface of each of the cathodes emitting the electrons, comprising a chemical bond between a cathode material composing the cathodes and a material different from the cathode material, the method comprises:  
  
etching the surface of each cathode in order to remove an oxide film formed on the cathodes; and  
  
forming a surface-modifying layer by a plasma treatment on the cathode surface, the surface-modifying layer comprising a chemical bond between the cathode material and the material different from the cathode material.
10. (Withdrawn) The method according to claim 9, further comprising:

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removing a impurity deposit layer from the surface-modifying layer by etching with a reactive gas containing at least oxygen.

11. (Withdrawn) The method according to claim 10, wherein the impurity deposit layer comprises a fluorocarbon layer.

12. (Original) An image display apparatus comprising:

an electron gun arranged inside a vacuum container and provided with the field-emission electron source according to claim 1; and

a phosphor layer to be irradiated with the electron beam emitted from the electron gun.

13. (Original) The image display apparatus according to claim 12, further comprising a deflector for deflecting the electron beam, wherein the electron beam deflected by the deflector is radiated on the phosphor layer.

14. (New) The field-emission electron source according to claim 3, wherein

the cathode material comprises silicon,

the material whose sputtering rate with respect to argon is lower than the sputtering rate of the cathode material comprises carbon, and

the chemical bond of the surface-modifying layer comprises a bond between the silicon of the cathode material and the carbon of the material whose sputtering rate with respect to argon is lower than the sputtering rate of the cathode material.

15. (New) The field-emission electron source according to claim 3, wherein

the cathode material comprises molybdenum,

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the material whose sputtering rate with respect to argon is lower than the sputtering rate of the cathode material comprises carbon, and

the chemical bond of the surface-modifying layer comprises a bond between the molybdenum of the cathode material and the carbon of the material whose sputtering rate with respect to argon is lower than the sputtering rate of the cathode material.